CLAIMS

1. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a liquid supply mechanism which supplies the liquid onto the substrate;

a projection optical system; and

a pressure adjustment mechanism which adjusts a pressure of the liquid supplied from the liquid supply mechanism.

2. The exposure apparatus according to claim 1, wherein the pressure adjustment mechanism adjusts the pressure of the liquid by adding the liquid or recovering a part of the liquid.

3. The exposure apparatus according to claim 1, wherein the liquid forms a liquid immersion area on an object arranged on an image plane side of the projection optical system, and the pressure adjustment mechanism adjusts the pressure of the liquid so that a force, which is exerted by the liquid on the object, is reduced.

4. The exposure apparatus according to claim 1, wherein the liquid forms a liquid immersion area on an object arranged on an image plane side of the projection

optical system, and the pressure adjustment mechanism adjusts the pressure of the liquid based on an affinity between the liquid and a liquid contact surface of the object.

5. The exposure apparatus according to claim 3, wherein the object is the substrate.

6. The exposure apparatus according to claim 1, further comprising a gas discharge mechanism which discharges a gas disposed on an image plane side of the projection optical system, wherein supply of the liquid is started by the liquid supply mechanism while discharging the gas by the gas discharge mechanism.

7. The exposure apparatus according to claim 6, wherein a gas discharge port of the gas discharge mechanism is arranged nearer to a projection area of the projection optical system than a liquid supply port of the liquid supply mechanism.

8. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a projection optical system;

a liquid supply mechanism which supplies the liquid; and

a gas discharge mechanism which discharges any gas present on an image plane side of the projection optical system, wherein:

a gas discharge port of the gas discharge mechanism is arranged nearer to a projection area defined by the projection optical system than a liquid supply port of the liquid supply mechanism, and supply of the liquid by the liquid supply mechanism is started while discharging the gas by the gas discharge mechanism.

9. The exposure apparatus according to claim 1 or 8, wherein the liquid supply port of the liquid supply mechanism is arranged on each of both sides of the projection area of the projection optical system, and the liquid is capable of being supplied from the both sides of the projection area.

10. The exposure apparatus according to claim 1 or 8, further comprising a first liquid recovery mechanism which has a liquid recovery port disposed outside the liquid supply port of the liquid supply mechanism with respect to the projection area of the projection optical system.

11. The exposure apparatus according to claim 10, further comprising a second liquid recovery mechanism which has a driving source which is different from that for the first liquid recovery mechanism and which has a recovery

port disposed outside the liquid recovery port of the first liquid recovery mechanism with respect to the projection area of the projection optical system.

12. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a projection optical system;

a liquid supply mechanism which supplies the liquid;

a first liquid recovery mechanism which has a liquid recovery port disposed outside a liquid supply port of the liquid supply mechanism with respect to a projection area of the projection optical system; and

a second liquid recovery mechanism which has a driving source which is different from that for the first liquid recovery mechanism and which has a liquid recovery port disposed outside the liquid recovery port of the first liquid recovery mechanism with respect to the projection area of the projection optical system.

13. The exposure apparatus according to claim 11 or 12, wherein the driving source includes an uninterruptible power source.

14. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a projection optical system;

a liquid supply mechanism which supplies the liquid;

a liquid recovery mechanism which recovers the liquid; and

a substrate stage which holds the substrate, wherein:

a velocity of movement of the substrate stage differs depending on a distance between a first position and a second position when the substrate stage is moved substantially linearly from the first position to the second position in a state in which a liquid immersion area is locally formed on the substrate stage by the liquid supply mechanism and the liquid recovery mechanism.

15. The exposure apparatus according to claim 14, when the velocity of movement of the substrate stage is decreased when the distance between the first position and the second position is not less than a predetermined amount as compared with when the distance between the first position and the second position is shorter than the predetermined amount.

16. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a projection optical system;

a liquid supply mechanism which supplies the liquid;

a liquid recovery mechanism which recovers the liquid;

and

a substrate stage which holds the substrate, wherein:

a velocity of movement of the substrate stage differs depending on a direction of movement of the substrate stage from a first position to a second position when the substrate stage is moved substantially linearly from the first position to the second position in a state in which a liquid immersion area is locally formed on the substrate stage by the liquid supply mechanism and the liquid recovery mechanism.

17. The exposure apparatus according to claim 16, wherein the velocity of movement of the substrate stage is decreased when the substrate stage is moved in a predetermined direction in which a liquid recovery force brought about by the liquid recovery mechanism is smaller than when the substrate stage is moved in a direction different from the predetermined direction.

18. The exposure apparatus according to claim 17, wherein the liquid recovery port of the liquid recovery mechanism is absent in the predetermined direction in which the liquid recovery force brought about by the liquid recovery mechanism is weak.

19. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate

through a liquid provided onto the substrate, the exposure apparatus comprising:

a flow passage-forming member which has a light-transmitting section and which includes a flow passage for the liquid, the flow passage being formed in the flow-passage forming member; and

a liquid supply unit which supplies the liquid to a space between the substrate and the flow passage-forming member via the flow passage of the flow passage-forming member, wherein:

a pressure of the liquid supplied to the space between the substrate and the flow passage-forming member is adjusted depending on a flow rate of the liquid supplied via the flow passage.

20. The exposure apparatus according to claim 19, further comprising a projection optical system, wherein the light-transmitting section is an opening, and an end portion of the projection optical system is accommodated in the opening.

21. The exposure apparatus according to claim 19, further comprising a liquid recovery unit which recovers the liquid disposed on the substrate via the flow passage.

22. The exposure apparatus according to claim 21, wherein an open end of the flow passage is formed as an

annular groove which surrounds a projection area of the projection optical system, the open end of the flow passage being formed on a surface of the flow passage-forming member opposed to the substrate.

23. The exposure apparatus according to claim 19, wherein a recess is formed on a surface of the flow passage-forming member opposed to the substrate, and a pressure sensor, which measures the pressure of the liquid, is provided in the recess.

24. The exposure apparatus according to claim 20, wherein the flow passage-forming member has a liquid supply flow passage and a liquid recovery flow passage.

25. The exposure apparatus according to claim 24, wherein the flow passage-forming member further includes a flow passage for adjusting the pressure.

26. The exposure apparatus according to claim 25, wherein the flow passage for adjusting the pressure includes a supply flow passage, and a recovery flow passage which is formed on a side nearer to a projection area of the projection optical system than the supply flow passage.

27. The exposure apparatus according to claim 25, wherein an end of the flow passage for adjusting the

pressure is open toward the projection optical system.

28. The exposure apparatus according to claim 19, further comprising a focus/leveling mechanism, wherein the flow passage-forming member is provided with an optical member through which a light beam radiated from the focus/leveling mechanism is transmitted.

29. The exposure apparatus according to claim 19, wherein a surface of the flow passage-forming member, which is opposed to the substrate, is hydrophilic.

30. A method for producing a device, comprising using the exposure apparatus as defined in any one of claims 1, 8, 12, 14, 16, and 19.

31. An exposure method for exposing a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure method comprising:

supplying the liquid onto the substrate;

adjusting a pressure of the liquid supplied onto the substrate; and

exposing the substrate by radiating the exposure light beam onto the substrate through the liquid.

32. The exposure method according to claim 31, wherein the pressure of the liquid is adjusted by adding

the liquid onto the substrate or recovering a part of the liquid.

33. The exposure method according to claim 31, wherein the pressure of the liquid is adjusted based on affinity between the liquid and a liquid contact surface of the substrate.

34. The exposure method according to claim 31, wherein the pressure of the liquid supplied onto the substrate is measured, and the pressure of the liquid is adjusted depending on the measured pressure.

35. An exposure method for exposing a substrate by radiating an exposure light beam onto the substrate via a projection optical system and a liquid, the exposure method comprising:

supplying the liquid onto the substrate;

discharging a gas at a position which is positioned in the vicinity of the projection optical system and which is positioned higher than a terminal end surface of the projection optical system in relation to a vertical direction; and

exposing the substrate by radiating the exposure light beam onto the substrate through the liquid.

36. The exposure method according to claim 35,

wherein supply of the liquid is started while discharging the gas.

37. An exposure method for exposing a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure method comprising:

supplying the liquid onto the substrate;

recovering the liquid disposed on the substrate by first and second liquid recovery mechanisms at positions farther than a position at which the liquid is supplied, with respect to a projection optical system; and

exposing the substrate by radiating the exposure light beam onto the substrate through the liquid, wherein:

driving power sources of the first and second liquid recovery mechanisms are different from each other.

38. The exposure method according to claim 37, wherein one of the driving power sources of the first and second liquid recovery mechanisms is an uninterruptible power source.

39. An exposure method for exposing a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure method comprising:

exposing the substrate by radiating the exposure light beam onto the substrate through the liquid;

moving the substrate from a first position to a second

position while retaining the liquid on the substrate when the substrate is unexposed; and

adjusting a velocity of movement of the substrate from the first position to the second position depending on a positional relationship between the first position and the second position.

40. The exposure method according to claim 39, wherein the velocity of movement of the substrate is decreased when a distance of the movement is not less than a predetermined distance as compared with when the distance of the movement is less than the predetermined distance.

41. The exposure method according to claim 39, further comprising recovering the liquid disposed on the substrate, wherein the velocity of movement of the substrate is decreased when the substrate is moved in a predetermined direction in which a liquid recovery force is weak as compared with when the substrate is moved in a direction different from the predetermined direction.

42. A method for producing a device, comprising using the exposure method as defined in any one of claims 31, 35, 37, and 39.